

INTERNATIONAL STANDARD

ISO
11546-1

First edition
1995-12-15

Acoustics — Determination of sound insulation performances of enclosures —

Part 1:

Measurements under laboratory conditions
(for declaration purposes)

*Acoustique — Détermination de l'isolement acoustique des
enclassements —*

*Partie 1: Mesurages dans des conditions de laboratoire (aux fins de
déclaration)*



Reference number
ISO 11546-1:1995(E)



Documents
Document Sharing Hub

Contents

	Page
1 Scope	1
2 Normative references	1
3 Definitions	2
4 Choice of measurement method	3
5 Instrumentation	4
6 Test methods applicable to enclosures with the actual sound source	5
6.1 General	5
6.2 Determination of sound power insulation	5
6.3 Determination of sound pressure insulation at a specified position	6
7 Test methods applicable to enclosures without the actual sound source	6
7.1 General	6
7.2 Reciprocity method	6
7.3 Artificial sound source method	7
7.4 Weighted sound power insulation and sound pressure insulation (reciprocity method)	8
7.5 Estimated noise insulation due to the enclosure for a specific noise spectrum	8
8 Uncertainty	8
9 Information to be recorded	8
9.1 Test object	8
9.2 Test conditions	8
9.3 Instrumentation	9
9.4 Acoustical data	9
9.5 Further information	9

© ISO 1995

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

10	Information to be reported	9
-----------	----------------------------------	----------

Annexes

A	Artificial sound source	10
B	Example of a source spectrum	12
C	Estimated noise insulation due to the enclosure for a specific noise spectrum	13
D	Bibliography	14

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11546-1 was prepared by Technical Committee ISO/TC 43, *Acoustics*, Subcommittee SC 1, *Noise*.

ISO 11546 consists of the following parts, under the general title *Acoustics — Determination of sound insulation performances of enclosures*:

- *Part 1: Measurements under laboratory conditions (for declaration purposes)*
- *Part 2: Measurements in situ (for acceptance and verification purposes)*

Annex A forms an integral part of this part of ISO 11546. Annexes B, C and D are for information only.

Acoustics — Determination of sound insulation performances of enclosures —

Part 1:

Measurements under laboratory conditions (for declaration purposes)

1 Scope

This part of ISO 11546 specifies laboratory methods for the determination of the sound insulation performance (insertion loss) of small machine enclosures.

It applies to a total enclosure only and not to the individual panels from which the enclosure is made.

NOTES

1 Sound insulation for enclosure panels such as wall elements, doors, windows, silencers, etc. should be measured in accordance with other relevant standards.

2 Related standards concern noise-attenuation measurements of enclosures *in situ* (ISO 11546-2) and cabins (ISO 11957).

The measurement methods specified in this part of ISO 11546 are based on International Standards in the series ISO 3740, ISO 9614 and ISO 11200 (see table 1). Depending on the method chosen, the sound insulation performance (insertion loss) of the enclosure is determined in terms of the reduction of sound power level or sound pressure level. Methods are given for measurements where the enclosure surrounds the actual sound source (machine). Where these methods are not practicable, alternative measurements can be performed using a reciprocity method (see definition 3.11 and subclause 7.2) or an artificial sound source.

This part of ISO 11546 is applicable without any restrictions to freestanding enclosures with volumes less than 2 m³. If the actual sound source is used, the sound insulation performance of enclosures with volumes exceeding 2 m³ can be determined provided that the requirements concerning maximum permissible volume in the standard used are fulfilled. The actual sound source method is applicable for any kind of enclosure design, for example enclosures fixed to the machine.

When the reciprocity method or the artificial sound source method is used, the maximum volume of the enclosure is limited to 2 m³. These methods are not applicable to close-fitting enclosures.

The wording "laboratory conditions" used in the title of this part of ISO 11546 indicates that test conditions and test environment (indoor or outdoor) fully conform to the respective International Standards given in table 1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11546. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11546 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 140-6:1978, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 6: Laboratory measurements of impact sound insulation of floors.*

ISO 717-1:—¹⁾, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation.*

ISO 3741:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for broad-band sources in reverberation rooms.*

ISO 3742:1988, *Acoustics — Determination of sound power levels of noise sources — Precision methods for discrete-frequency and narrow-band sources in reverberation rooms.*

ISO 3743-1:1994, *Acoustics — Determination of sound power levels of noise sources — Engineering methods for small, movable sources in reverberant fields — Part 1: Comparison method for hard-walled test rooms.*

ISO 3743-2:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering methods for small, movable sources in reverberant fields — Part 2: Methods for special reverberation test rooms.*

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane.*

ISO 4871:—²⁾, *Acoustics — Declaration and verification of noise emission values of machinery and equipment.*

ISO 9614-1:1993, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points.*

ISO 9614-2:—³⁾, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 2: Measurement by scanning.*

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other*

specified positions — Engineering method in an essentially free field over a reflecting plane.

ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections.*

IEC 651:1979, *Sound level meters.*

IEC 804:1985, *Integrating-averaging sound level meters.*

IEC 942:1988, *Sound calibrators.*

IEC 1260:—⁴⁾, *Electroacoustics — Octave-band and fractional-octave-band filters.*

3 Definitions

For the purposes of this part of ISO 11546, the following definitions apply.

3.1 A-weighting: Frequency weighting as defined in IEC 651.

3.2 enclosure: A structure enveloping a noise source (machine), designed to protect the environment from this noise source (machine).

NOTE 3 An enclosure can be, for example, a freestanding structure terminated on the floor or a structure more or less fixed to the machine. (Concerning enclosures fixed to the machine, see clause 4.)

3.3 sound pressure level, L_p : Ten times the logarithm to the base 10 of the ratio of the square of the sound pressure of a sound to the square of the reference sound pressure. Sound pressure levels are expressed in decibels. The reference sound pressure is 20 μPa (2×10^{-5} Pa).

3.4 average sound pressure level, $\bar{L}_p$: Mean-square of the sound pressure levels:

$$\bar{L}_p = 10 \lg \left(\frac{10^{0,1L_{p1}} + 10^{0,1L_{p2}} + \dots + 10^{0,1L_{pn}}}{n} \right) \text{ dB}$$

where L_{p1} , L_{p2} , ..., L_{pn} are the sound pressure levels, in decibels, to be averaged.

1) To be published. (Revision of ISO 717-1:1982 and ISO 717-3:1982)

2) To be published. (Revision of ISO 4871:1984)

3) To be published.

4) To be published. (Revision of IEC 225:1966)